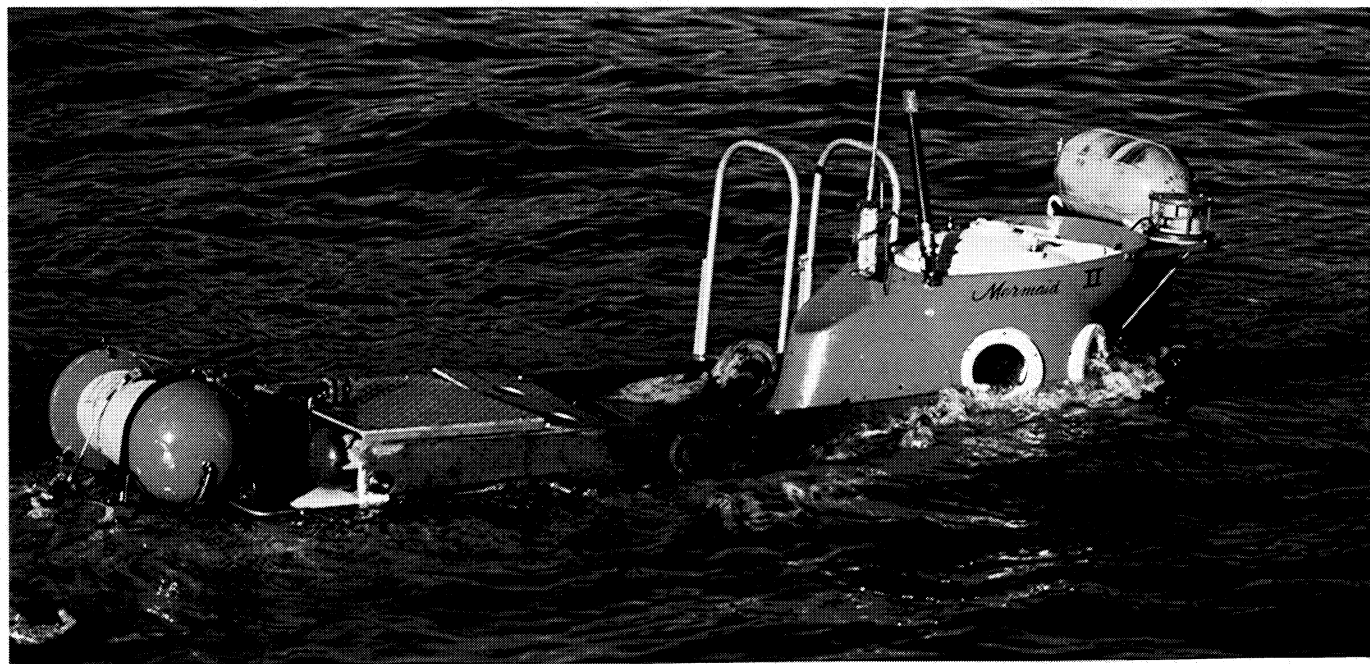
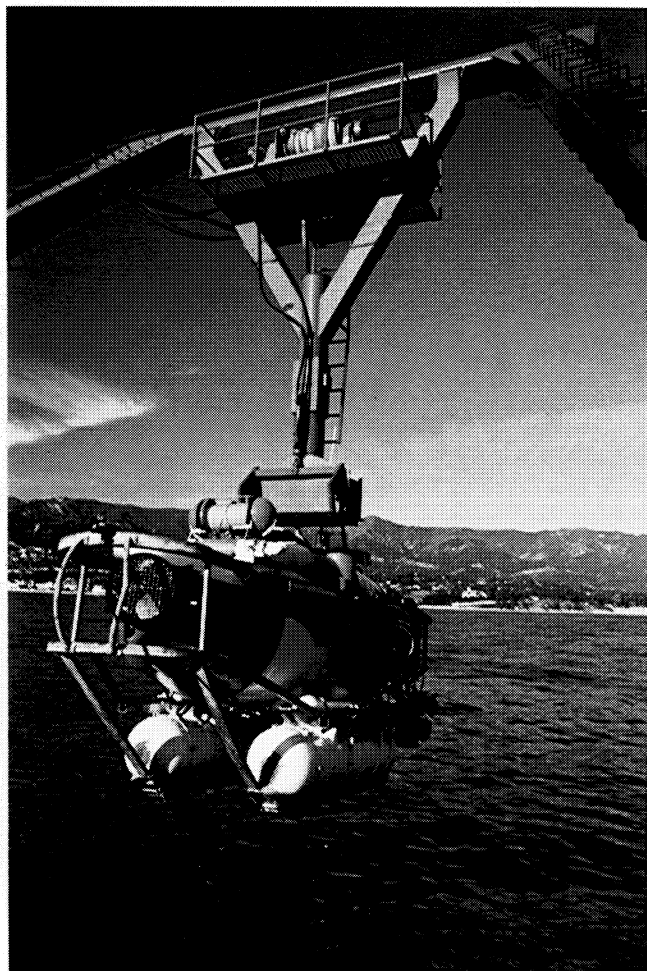
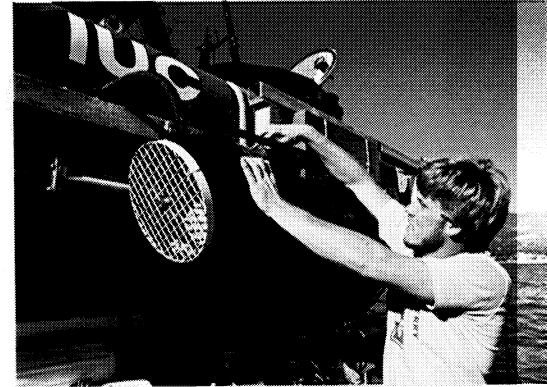
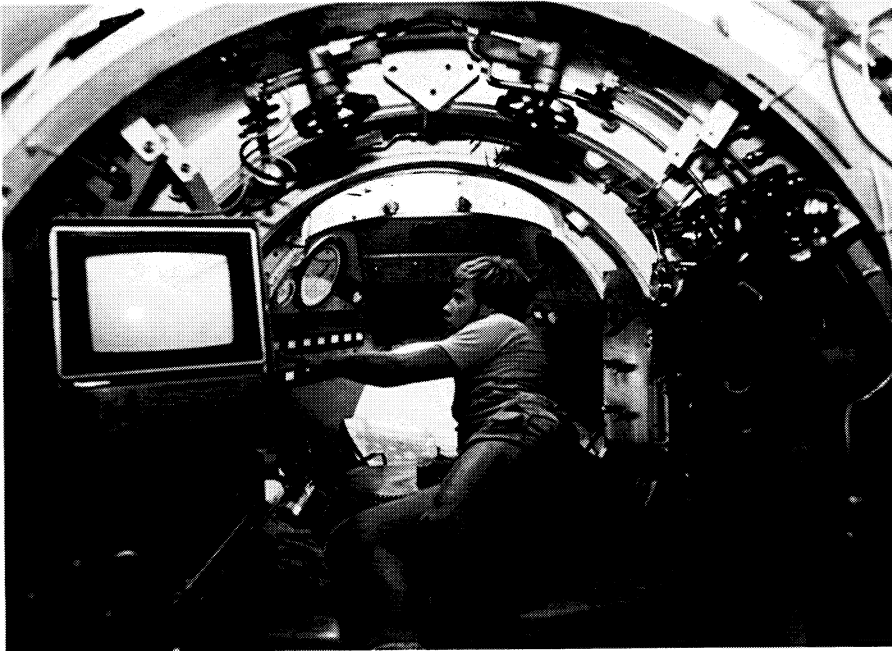

Motor Controllers

At right, the Mermaid II two-person submersible is being lowered into the Pacific Ocean from a ship off Santa Barbara, California. Below, the underwater vehicle is ready to submerge; the craft's interior is pictured on the opposite page. Operated by International Underwater Contractors, Inc. (IUC), City Island, New York, Mermaid II can reach depths of 1,000 feet to perform a variety of underwater assignments, such as checking pipelines for oil companies, studying fish feeding habits for the National Oceanic and Atmospheric Administration, and charting the continental shelf for the U.S. Geological Survey. The submersible is propeller-driven by a system of five DC brushless motors (one shown at far right) with new electronic controllers that originated in work performed in a NASA/Department of Energy (DoE) project managed by Lewis Research Center.

In cooperation with Virginia Polytechnic Institute and State University, the Industrial Drives Division (IDD) of Kollmorgen Corporation, Radford, Virginia developed an electric vehicle traction motor system as part of a NASA/DoE program aimed at advancing propulsion technology for electric and hybrid vehicles in the interest of national energy conservation. The IDD system was based on a permanent magnet DC motor to take advantage of the high efficiency it offered. A key feature of the system was electric commutation rather than mechanical commutation for converting AC current to DC. Electric commutation enabled elimination of the brushes and commutator conventionally used in DC





motors, resulting in a motor system of high performance in relation to size and weight, high reliability and—because there are no brushes to replace—minimal maintenance requirements.

From this project evolved an IDD family of DC brushless motor controllers known as the ECC (Electronic Commutation Controller) series. The ECC employs a six-transistor bridge to supply electric current to the motor in a sensor-regulated sequence, providing smooth torque delivery over a wide operating range. It found its principal application in the propulsion systems of underwater vehicles, including Mermaid II, several other IUC submersibles, and submarine craft of other companies that use IDD brushless motors.

More recently, IDD introduced the brushless motor/ECC to industrial use as a drive system for large machines. Customers include a General Electric Company plant in Fort Wayne, Indiana and Ingersoll Milling Machine Company, Rockford, Illinois. The photo at right shows an IDD motor installed on a large machine tool built by Ingersoll.

